Preventing Natural Resource Impairment

"Humans have achieved mastery over most of the earth's surface. With this mastery has come an acute awareness … that the land will not sustain humans unless humans sustain the land."

—William L. Halvorson
National Parks and Protected Areas: Their Role in Environmental Protection

The National Park Service is responsible for ensuring that the resources of the National Park System are passed on "unimpaired" for the enjoyment of future generations. Park management decisions are predicated on the test that actions will not impair resources or the values associated with them. Nevertheless, the role of the National Park Service as caretaker of the nation's extraordinary heritage is increasingly challenging given the wide variety of influences that affect park resources, many of which arise outside park boundaries and result from complex environmental, social, political, and economic factors. As the articles in this chapter illustrate, maintaining the health of park resources requires vigilance. It also involves the courage to lead a debate on what is necessary to preserve park resources. It takes skill to marshal scientific investigation to inform park managers and the public about a threat. And it demands patience to effect resolution. Finally, park preservation is impossible without diligence, expertise, strong partnerships, and public support. At stake is the National Park Service's "contract with the future"—the perpetuation of a park system that is the collective expression of America's superlative heritage.

Sustainer of life in the Chihuahuan Desert, the Rio Grande stopped flowing in May 2003 before the start of seasonal rains. This extremely rare event is heightening concerns for the ecological health of the river ecosystem in Big Bend National Park and the Rio Grande Wild and Scenic River, which has been in decline for decades.

Big Bend's Rio Grande faces uncertain future

By Raymond Skiles and Jeff Bennett

REGIONAL AND EVEN NATIONAL media attention briefly turned to the Rio Grande in Big Bend National Park in May 2003. The river, once a mighty regional and international resource, simply stopped flowing. For a few weeks before seasonal rains began, portions of the river became only pools isolated between sun-bleached gravel beds. Historical records indicate the river stopped during droughts of the past, most recently in the 1950s. But the May event brought to light the more disturbing long-term decline of the Rio Grande ecosystem. Dams, diversions, industrial and agricultural contamination, and the invasion of exotic species are killing this river.

Dams and diversions have stopped the natural flooding that occasionally scoured banks and realigned the channel. Without regular floods the river channel grows narrower and deeper. Cobble bars that were once productive habitat for fish and invertebrates have become choked with silt and no longer support these organisms. Sustained low flow reduces dissolved oxygen, concentrates contaminants, and favors exotic species over natives that are adapted to flow variability.

The Rio Grande was once home to 38 native fish species. Two are now extinct, one is federally endangered, and nine are no longer found in the Big Bend portion of the river. Eight exotic fish species compete with natives; nine of the remaining native fish species are at risk. Nutria, large South American rodents that prefer calm water, are abundant in the river. These voracious herbivores have stripped aquatic vegetation from the river and adjacent spring-fed pools that are the only habitat of endangered Big Bend mosquitofish. The elegant slider, an exotic turtle species that is suited to slow-moving water, now hybridizes with the native Big Bend slider, a species adapted to the more frequent historical flooding of the Rio Grande. Of at least five native mussels, only dead shells of three have been found in recent years.

"The National Park Service and partner agencies are gathering information needed to demonstrate the relationship between river changes and resource damage."

Native plants such as cottonwood and willow are now rare. Exotic giant reed, tamarisk, bermuda grass, and other nonnatives dominate the banks. The presence of pesticides, fertilizer, and urban waste has led to warnings for humans to avoid contact with the water and consume fish only in moderation.

Though the Rio Grande is a significant resource in Big Bend National Park and is the primary resource in the Rio Grande Wild and Scenic River, park managers currently have little influence to halt or slow ongoing degradation. Water law does not allow for in-stream flow rights, while competition for regional water sources is increasing. Regardless, the National Park Service and partner agencies are gathering information needed to demonstrate the relationship between river changes and resource damage. These partnerships and recent NPS initiatives such as the Natural Resource Challenge have resulted in baseline assessments of channel characteristics, water quality, flow cycles, and species inventory, but essential information is still missing. What are the requirements for minimum flow, water quality, and channel conditions that will sustain species now declining or favor natives over exotics? Where will local springs and tributaries provide enough water to attempt restorations? And most significantly, how can park managers help to reverse the effects of decades of decline?

Mariscal Canyon, start of the Rio Grande Wild and Scenic River designation in Big Bend National Park, was reduced to pools of water isolated by sun-bleached gravel beds in May. The flow stoppage highlights the effects of drought, to be sure, but also the effects of dams and diversions; agricultural, urban, and industrial contamination; and exotic species invasion. Park staff has little influence to slow the degradation of river resources.

Historical trends leave little room for optimism about the Rio Grande's future. Will the river be reduced to pretty scenery on the surface and waste transport below? Or can its ecological integrity be rescued? Only a combination of societal values that create policy and legal opportunities, and sound science that demonstrates resource needs, will provide real opportunities to improve the Rio Grande. ■

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Interagency cooperation and science keep the Buffalo River system free-flowing

By Faron Usrey

BUFFALO NATIONAL RIVER (Arkansas) provides a case study of how NPS science and monitoring played a role in the decision-making process to revoke a permit for a dam that would have affected park resources. The story begins in 1996 when a regional water district performed a water-supply analysis that recommended building a reservoir on Bear Creek—a large tributary to the mid-reaches of the Buffalo River—to meet the growing need for water in the area. Established in 1972 as the country's first national river, Buffalo National River is in a watershed of which about 61% is privately owned. Approximately 11% of the watershed is contained within the boundaries of the national river, and 28% is managed by other federal and state land management agencies. Local authorities applied for and received a permit from the U.S. Army Corps of Engineers (the Corps) to build a dam on Bear Creek. The Corps issued an environmental assessment (EA), which was open for public review under the National Environmental Policy Act (NEPA).

To understand the effects of the proposed impoundment on the river's flow and biota and to meet a public obligation under NEPA, park managers joined a multiagency effort with the U.S. Geological Survey (USGS), U.S. Fish and Wildlife Service, University of Arkansas, and independent natural resource professionals to ascertain quantifiable impacts on the river system. In 2002, USGS hydrologists determined that during times of low flow (August through October), as much as 25% of the flow below the Buffalo River's confluence with Bear Creek originates from Bear Creek. Concerns about the aquatic community's dependence on the creek's flow at these times generated several investigations. In 2002, after eight national and local environmental groups filed suit against the Corps, the permit approving the damming of Bear Creek was officially revoked. The Corps has agreed to hold any future water development permit decisions in abeyance until the National Park Service has made a Determination of Effect as required under Buffalo National River's enabling legislation.

"Being able to quantify ecosystem requirements of the river's flow with valid scientific results was critical in the decision [to keep Bear Creek free-flowing]."

Monitoring results on the Buffalo River in Arkansas over a 10-year period prior to the EA strengthened arguments for further watershed protection by natural resource agencies through targeted conservation programs that stress the reduction of agricultural runoff. Monitoring results showed a decline in water quality on certain reaches of the river. This decline was the basis for cooperative studies among Buffalo National River, state agencies, the USGS, and local universities.

Although untamed rivers are part of our cultural and natural heritage, virtually every river in the lower 48 states is now regulated by dams, locks, or diversions. The Buffalo River is one of the few remaining free-flowing rivers, offering both swift-running and placid stretches. Recently, staff diligence and science kept a main tributary, Bear Creek, on Buffalo River free-flowing.

Researchers, who examined the effects of human activities and changes in land use on the river's natural resources, documented degradation. They reported that land-use changes, in particular the conversion of forest to permanent pasture, negatively impact the river's water quality, in-stream habitat, geomorphic structure, and aquatic communities. Funding from local universities and state and federal agencies—with the largest portion of the federal funding originating from the NPS Water Resources Division and the Natural Resource Preservation Program—covered the costs associated with these highly beneficial and timely scientific studies.

National Park Service science, vigilance, and cooperation with other agencies kept Bear Creek free-flowing. Being able to quantify ecosystem requirements of the river's flow with valid scientific results was critical in the decision. Because park managers at Buffalo National River were aware of community activities in the watershed and had been actively monitoring the river, park resources were preserved and the park's legal standing was strengthened. ■

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Wind farms: An emerging dilemma for East Coast national parks

By Betsie Blumberg

LAND-BASED WIND FARMS have been providing clean energy in the United States for some time, but although Europe harnesses offshore wind, to date there are no offshore wind farms in the United States. Recently, however, several proposals for offshore wind farms have been submitted to federal and state regulatory agencies. These are to be located along the Atlantic Coast where ideal conditions exist: strong winds, relatively shallow water, and a large human population in need of electricity. National parks along the East Coast face the dilemma of welcoming a renewable, nonpolluting energy source and at the same time protecting park resources from environmental impacts not yet fully understood.

This view of the sea from Cape Cod National Seashore would change if a proposed wind farm were built offshore. The Atlantic Coast provides ideal conditions for the operation of offshore wind power plants, but their impact on natural resources is not yet understood.

The sheer magnitude of these power plants arouses concern. Wind farms are very big—they may cover an area of 25 square miles (65 sq km) with 150 wind turbines that are 400 feet (122 m) tall. The pylons supporting the turbine towers are sunk 30 to 50 feet (9 to 15 m) into the ocean floor. The towers are lighted to be visible to boats and aircraft. The turbines produce a low level of noise.

Companies that produce wind power have posted notice of intent, or have submitted formal proposals, to construct offshore wind farms in the waters of six states: Massachusetts, New York, New Jersey, Delaware, Maryland, and Virginia. These account for nine possible wind farms, although one company, Winergy, has identified 21 potential sites along the north Atlantic Coast.

The permitting process for these power plants starts when a proposal is submitted to the agency that has jurisdiction over the waters at the site. The U.S. Army Corps of Engineers holds jurisdiction in federal waters; in state waters it belongs to the state's environmental protection agency. The lead agency prepares the environmental impact statement (EIS) or other appropriate review document depending on individual state law. The cooperating agencies (all federal, state, and local agencies involved) submit their concerns, review the final EIS or review document, and advise the lead agency of their response to it. The lead agency then decides to accept or deny the proposal. The National Park Service, as a cooperating agency, determines whether the impacts cited in the EIS are acceptable for park purposes based on law and NPS policy. If a cooperating agency opposes the lead agency's decision, it can appeal it to the appropriate state or federal court.

One park in the Northeast, the Appalachian National Scenic Trail, has already had experience with the prospect of land-based wind farms. In four states, wind farms have been proposed on the windy ridges near the trail. Advocates for the trail, the Appalachian Trail Conference, argue that where a utility is proposed, sufficient mitigation must be incorporated so that trail values, such as quality of experience and preservation of views (particularly important to protect on this scenic trail), are not degraded. In Tennessee a proposal was revised in favor of the trail, and the wind farm was built 20 miles (32 km) away. Concern is now focused on a proposal in Maine from Endless Energy Company for a wind farm that would be visible from the trail for four days of hiking.

In Massachusetts, Winergy has proposed building a wind farm near the town of Truro, just beyond the quarter-mile offshore boundary of Cape Cod National Seashore. According to Nancy Finley, chief of natural resources at the park, the proposed site for the wind farm has been designated by the state as Massachusetts Ocean Sanctuary, which likely has additional regulatory requirements. Nonetheless, the proposal raised concerns at the park about impacts in the air, in the water, and on land.

In the air, wind turbines may stand in the pathway of migratory birds, particularly the thousands of sea ducks whose route over water follows the shoreline. The scenic view would also be affected because this wind farm would be near shore and visible from the park. In the ocean, construction of the towers may disturb seafloor resources. On land the constantly shifting shoreline, which can move 30 or 40 feet (9 or 12 m) in a single storm, makes securing the transmission line very challenging. The transmission line would run underground through the park, its construction disturbing terrestrial natural resources and threatening archeological remains in its path.

Finley says that the park will work within the existing permitting process to ensure that environmental impacts are addressed. That is what each park near a proposed offshore wind farm along the Atlantic Coast will be doing as it works to accommodate this renewable energy source while protecting natural and cultural resources that may be affected. ■

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Managing energy development issues to protect park resources

By John Bunyak, John Reber, and Lisa Norby

AS PART OF THE EFFORT to improve energy independence, there has been a push to streamline the development of all energy sources—particularly oil, gas, and coal-bed methane—in the western United States. The West is home to many of the nation's parks, and increases in energy development activities both outside and along park boundaries may negatively impact the air and water quality of nearby park units. National Park Service managers are also concerned about the possible impacts of new or expanded transportation pipelines or power lines through parks. In 2003, park managers were actively involved in developing strategies to minimize the potential harm to park resources from energy development activities.

"Park managers can no longer protect the natural resources of our nation's parks without paying attention to, being informed of, and becoming actively involved in activities like energy development that are happening outside park boundaries."

The Rocky Mountain region has been at the center of the West's energy development activities, in particular the Powder River Basin area of Montana and Wyoming. The Wyoming Powder River Basin Oil and Gas Project alone involves developing and operating approximately 39,000 new coal-bed methane wells, 3,200 oil wells, and various support facilities. The National Park Service concluded that air emissions associated with these activities could adversely impact visibility and other air quality–related values at several park units. These units include Badlands and Wind Cave National Parks, which are mandatory Class I air quality areas under the Clean Air Act. Devils Tower National Monument, Fort Laramie National Historic Site, Jewel Cave National Monument, and Mount Rushmore National Memorial, all Class II air quality areas, would also be affected.

Superintendents and natural resource staff from several of the affected parks and regional offices met with NPS Air Resources Division staff in May 2003 to discuss ways to work together to protect park resources as energy development proceeds, particularly in the Powder River Basin. Subsequently NPS staff met with representatives from the Bureau of Land Management, state agencies, tribes, and other entities to establish working groups to address the problem. The resulting air quality task group will develop a monitoring plan and an adaptive management strategy to assess and mitigate the cumulative air quality effects of coal-bed methane development.

In response to the White House energy task force and the National Energy Policy, federal and state agencies in the Rocky Mountain region were asked in late spring 2003 to form a Rocky Mountain Energy Council (RMEC). The goal of the council is to streamline energy development in Wyoming, Montana, Utah, Colorado, and New Mexico. The National Park Service is participating in the RMEC process, although there are no proposals yet for active energy development sites within park units. Park managers are participating in the process to draw attention to their concerns about possible impacts on park resources in these states. Staff from the NPS Intermountain Support Office (Divisions of Natural Resources Research and Technology, and Ranger Activities) and the Natural Resource Program Center (Air, Water, and Geologic Resources Divisions) are involved and available for assistance as the process continues.

In January 2003 the National Park Service also held its first Western Energy Summit, in Phoenix, Arizona. The summit was created to give park resource managers and superintendents the background information they need to constructively and effectively influence decisions affecting energy development on federal lands adjacent to parks and to advance sound energy-use strategies within park boundaries. The gathering included not only NPS staff but also key representatives from other federal and state agencies, such as the Environmental Protection Agency, Office of Environmental Compliance, Bonneville Power Administration, Western Governor's Association, National Renewable Energy Laboratory, and University of Denver. Rebecca Watson, assistant secretary for land and minerals management, opened the conference with a presentation on the National Energy Policy and its implications for the western United States. More detailed information about the Western Energy Summit, including handouts, maps, and fact sheets, is available on the NPS intranet at www2.nrintra.nps.gov/energysummit.

Park managers can no longer protect the natural resources of our nation's parks without paying attention to, being informed of, and becoming actively involved in activities like energy development that are happening outside park boundaries. Increasingly the National Park Service will need to focus on the big picture of energy development to be effective stewards. ■

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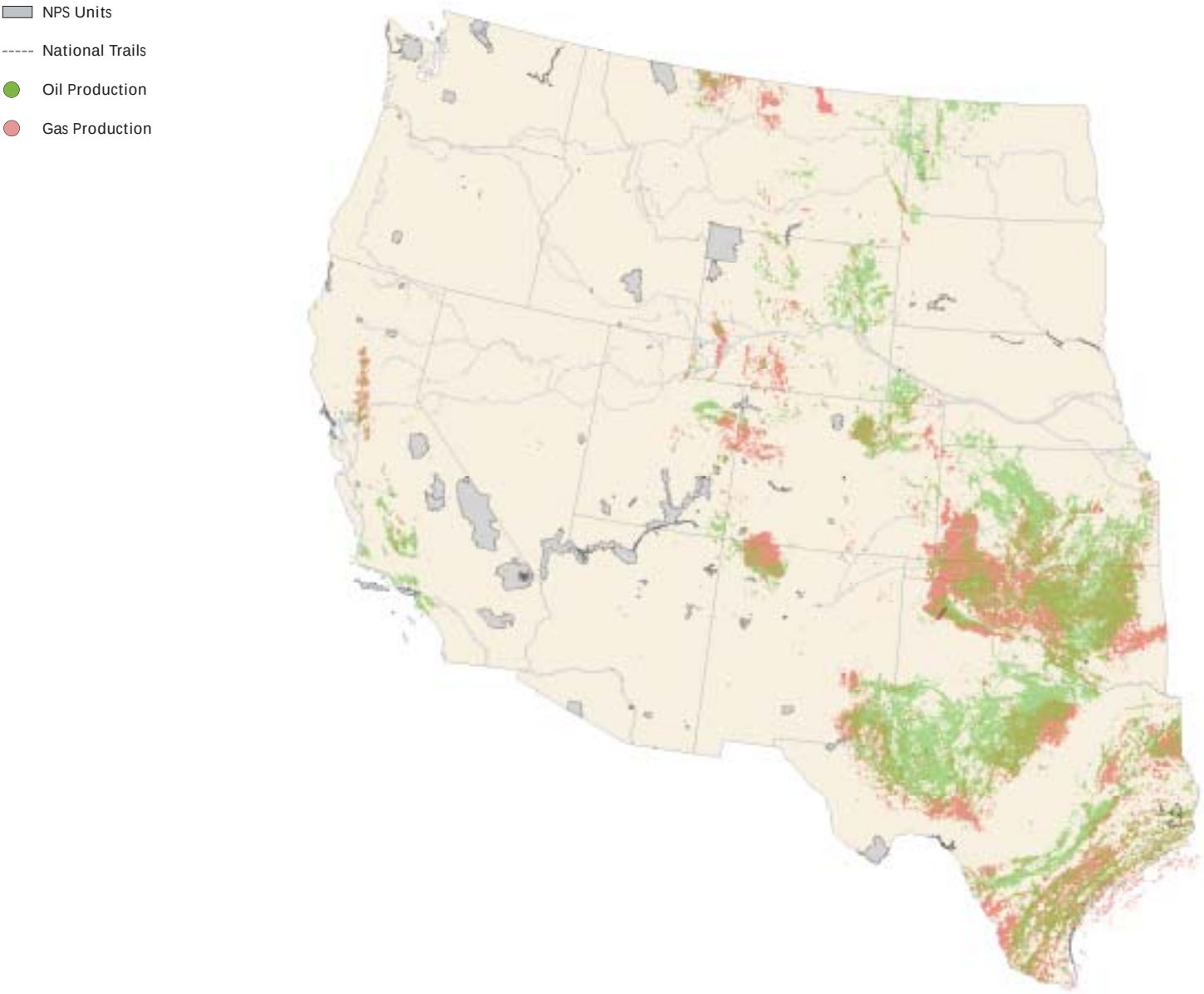
OIL AND GAS PRODUCTION IN THE WESTERN UNITED STATES



Winter sampling of snowpack in eight western parks to assess deposition of toxic compounds

By Tamara Blett

PESTICIDES AND INDUSTRIAL by-products may be leapfrogging over urban and rural areas to deposit in high-elevation ecosystems such as Rocky Mountain National Park, Colorado. Scientific studies in the Arctic have revealed that organic compounds with low vapor pressures move, in several successive stages of deposition and evaporation, toward colder areas of the biosphere, such as the poles, and upward in mountainous regions to settle in high-elevation snow. Through this "cold condensation" phenomenon, areas of some western national parks may become sinks for these compounds, known as persistent organic pollutants. In 2003, U.S. Geological Survey (USGS) researchers Don Campbell, Alisa Mast, and George Ingersoll began a three-year field sampling project to examine snowpack chemistry in Rocky Mountain National Park and seven other western and Alaskan parks to determine how much of these toxic compounds is being deposited at high-elevation and high-latitude park sites.

Air masses over the western United States may contain pollutants from sources as far away as Europe and Asia, and from local or regional sources in North America. Scientists suspect that some air masses contain persistent toxic compounds, such as pesticides like DDT, and industrial by-products like PCBs and dioxin. Snow is efficient in removing pollutants from the atmosphere and depositing them in high-elevation terrestrial and aquatic ecosystems. Snowfall provides 50% to 90% of annual precipitation in high-elevation and high-latitude areas of the western United States. In many of these areas, seasonal snowpacks that accumulate during the fall, winter, and spring contain an integrated record of chemicals deposited during the snow season.

"Information acquired through this project will enhance scientific understanding of the global transport of airborne contaminants and their associated effects on sensitive ecosystems in western parks."

Once deposited, persistent organic pollutants can accumulate and concentrate in food webs where they can impact reproductive success, growth, behavior, disease, and survival of animals high on the food chain, such as fish, birds, and mammals. Additionally, glacial melt and

U.S. Geological Survey scientist Don Campbell collects snow samples at Rocky Mountain National Park that will later be examined in the laboratory for toxic compounds, including mercury. The project is part of a coordinated three-year study in eight western national parks to assess levels of contaminants that travel long distances in the air and are deposited in high-elevation and high-latitude ecosystems where they can concentrate in food webs.

snowmelt contribute to primary water sources for people residing in the mountain West and Arctic areas. Many communities obtain their drinking water almost entirely from snow and glacier meltwater. These water sources may contain airborne contaminants.

Snow is being sampled at two sites in each park for three consecutive years. These sites are located in or near two watersheds in each park selected for comprehensive water, sediment, and biological sampling. Snow samples are collected by USGS researchers with assistance from the National Park Service and other partners. Crews collect samples near the time of annual maximum snow accumulation but before the onset of spring snowmelt. Researchers dig two large snow pits and then cut a vertical column of snow from each pit. Sampling crews must use clean techniques to shovel, bag, and transport approximately 40 gallons (150 liters) of snow from each site, which will yield about 13 gallons (50 liters) of meltwater for analysis. Access to the sites is by aircraft, snowmobile, skiing, snowshoeing, hiking, or pack animals. Samples collected from each snow pit are analyzed for major ions, nutrients, dissolved organic carbon, trace metals, mercury, particulate matter, and organic contaminants.

The snow sampling project is part of the Western Airborne Contaminants Assessment Project (WACAP) to determine the risk from airborne contaminants to ecosystems and food webs in western national parks. Biological effects analysis of airborne contaminants from six ecosystem components (snow, water, sediment, lichen, bark, and fish) is being conducted in eight key parks in the West and Alaska (Rocky Mountain, Glacier, Sequoia, Olympic, Mount Rainier, Denali, Noatak, Gates of the Arctic). Contaminant concentrations in moose consumed by subsistence hunters will also be assessed in Alaska. The Environmental Protection Agency, USGS, USDA Forest Service, Oregon State University, and University of Washington are working in partnership with the National Park Service on this assessment. Information acquired through this project will enhance scientific understanding of the global transport of airborne contaminants and their associated effects on sensitive ecosystems in western parks. It will also help the National Park Service determine what actions may be needed to mitigate potential effects or protect subsistence populations. Some contaminant signals or combinations may be used to determine where the industrial by-products or pesticides originate and whether these sources are local, regional, national, or international. Contaminant deposition in the snowpack will be related to contaminant levels in air, lake water, lake sediments, plants, and fish, thereby linking ecosystem impacts to airborne contaminant pathways. ■

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Partnering to reduce risk of West Nile Virus

By Betsie Blumberg

The combined efforts of volunteers and several government agencies are reducing the risk of West Nile Virus at Allegheny Portage Railroad National Historic Site and adjacent state game land in Pennsylvania. Trash and tires had been dumped illegally on these lands over many years, creating breeding habitat for mosquitoes that may carry the disease. On two separate cleanup days in 2003, cooperating agencies eliminated these breeding grounds.

Good riddance to bad rubbish! Trucks dispose of tires abandoned at Allegheny Portage Railroad National Historic Site and adjacent state game lands, reducing breeding habitat for mosquitoes, carriers of West Nile Virus.

In June, volunteers from the local Target store worked with Pennsylvania Cleanways of Blair County, the Pennsylvania Game Commission, and the National Park Service to collect 8 tons of trash and tires from one large dump on the game land and along several miles of historic portage trace at the national historic site. The park law enforcement officer, Tom Stinedurf, coordinated the event with Dave Thomas of Pennsylvania Cleanways. That cleanup was so successful that Thomas contacted the national historic site again about three old dumps on park and game land where hundreds of tires had accumulated.

The result was a project involving six government agencies, coordinated by Stinedurf, Thomas, and Natural Resource Manager Kathy Penrod of Allegheny Portage Railroad. On the cold and rainy cleanup day in October, prisoners from the state correctional institution at Cresson did the work, heavy equipment brought in by the Pennsylvania Game Commission moved and loaded the tires and trash, and trucks and drivers from the Pennsylvania Department of Transportation and Blair County Solid Waste and Recycling hauled it away. Together they removed about 1,400 tires and 5 tons of trash.

By the end of the cleanups the dumps were gone for good. The sites are now clear and will no longer attract trash. And, most importantly, they no longer support breeding ground for potential carriers of West Nile Virus. ■

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Small Saint-Gaudens managing exotic invasives

By Betsie Blumberg

Resource Manager Steve Walasewicz releases beetles in a field of invasive, exotic purple loosestrife vegetation. The biological control is one mechanism that is helping the small northeastern park see the results from executing its Exotic Plant Management Plan.

Controlling invasive vegetation is an especially high priority at Saint-Gaudens National Historic Site in Cornish, New Hampshire. Invasive plants have the capacity to quickly overwhelm native vegetation and alter habitats in the small, 150-acre (61-ha) park. Consequently, staff are implementing the park's Exotic Plant Management Plan and making substantial progress.

The park includes the historic home, studios, and 100-year-old formal gardens of its namesake, the American sculptor Augustus Saint-Gaudens. Surrounding these cultural features, forest makes up about 80% of the park. The most troublesome invasives are purple loosestrife (*Lythrum salicaria*), Norway maple (*Acer platanoides*), Japanese barberry (*Berberis thunbergii*), black swallow-wort (*Vincetoxicum nigrum*), yellow iris (*Iris pseudocorus*), and Morrow honeysuckle (*Lonicera morrowii*). Various methods of control are being employed, from cutting down Norway maples and pulling up seedlings to releasing beetles (*Galerucella* sp.) to attack the purple loosestrife. The formal garden itself is a source of exotics; Japanese tree lilac (*Syringia reticulata*) growing in the garden across the road from woodland has produced offspring in the forest.

Inventory and mapping of 17 invasive species were completed in 2003, and information on the location, size, density, and distribution of the populations was stored in GIS format. With these data the control phase of the plan was launched.

To pay for the labor to implement the plan, the park tapped various funding sources. The NPS Public Land Corps supported three interns, hired through the Student Conservation Association, who each spent nine months at the park doing the inventory and mapping, assisting with the preparation of the plan and associated compliance documentation, and undertaking control operations in the field. Local Boy Scouts and other volunteers occasionally lent a hand, too. Removing the invasives will eventually include collaborating with nearby Marsh-Billings-Rockefeller National Historical Park (Vermont) to obtain seasonal field personnel. The park also plans to work closely with the Northeast Region's newly established Exotic Plant Management Team, stationed at Delaware Water Gap National Recreation Area (Pennsylvania and New Jersey).

The small size of the park provides a special opportunity to control invasive plants and restore native species. The remaining exotics, says Natural Resource Manager Steve Walasewicz, will then mimic their presence in their native environments, where they are not invasive. ■

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Implementing the Natural Sounds Program

By Bob Rossman

NATIONAL PARKS may seem to be the perfect place for quiet, solitude, and contemplation, yet managers must also address the needs of recreationists who may want to pursue activities that are loud or intrusive. Noise has the potential to affect wildlife and cultural resources and diminishes wilderness values to the extent that desired visitor experiences and expectations may not be realized. The Natural Sounds Program, initiated in 2000, assists a number of parks in dealing with such issues by collecting acoustic data, providing impact assessments, defining problem areas, and recommending potential solutions.

"Park managers must determine the level to which natural sounds are to be protected, preserved, or restored, as well as the type and amount of human-caused sound that is necessary or desirable in light of park purposes."

In 2003 the Natural Sounds Program developed practical guidance for parks in developing soundscape management and noise prevention plans. Guidelines help park field personnel and managers understand and apply the fundamentals of acoustic science. In a related development, the Natural Sounds Program completed a section of the "Interim Final Guidance on Assessing Impacts and Impairment to Natural Resources" (April 2003) to provide assistance in noise impact analysis.

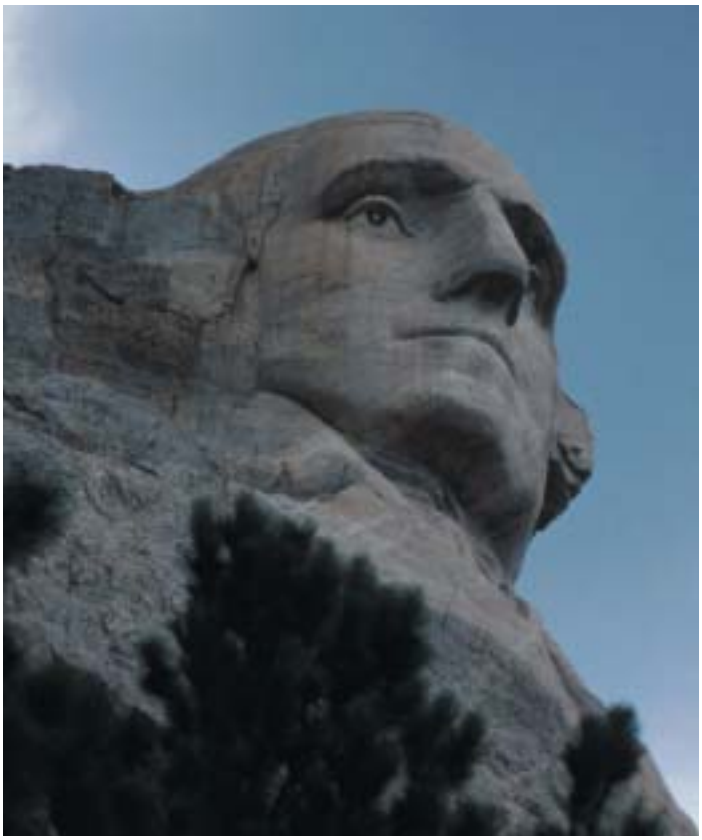
Zion, Hawaii Volcanoes, Haleakala, and Lassen Volcanoes National Parks are using the guidelines to draft proposals for soundscape management plans. These and other parks initiated planning efforts in response to increased sources of noise that could affect park soundscapes. A soundscape management plan suggests the characteristics and appropriateness of existing noise in relation to the natural condition and purposes for which a park was established, providing the basis for scientific assessment of noise impacts associated with proposed actions by the National Park Service or others.

The study of acoustics, as it relates to preserving natural or culturally important sounds in parks, is an evolving science. Acoustic sampling programs are intended to characterize a national park soundscape that may be viewed as "natural ambient" or "baseline," without the sounds caused by the presence and movement of people. Further data collection efforts are made to measure human-related sounds that are imposed on the natural soundscape. The collection of data can involve methods as simple as listening to sounds over a period of time (audibility) and recording their source and duration. Information about weather, particularly wind, must be collected at the same time in order to interpret measurement results. The collection of acoustic data is a prelude to making determinations about sound or noise in national park units. Park managers must determine the level to which natural

sounds are to be protected, preserved, or restored, as well as the type and amount of human-caused sound that is necessary or desirable in light of park purposes.

Another major emphasis for the Natural Sounds Program in 2003 was the initiation of air tour management planning. Under the National Parks Air Tour Management Act, the Federal Aviation Administration (FAA) is the lead agency for producing an air tour plan for each affected park. The National Park Service is a cooperating agency with joint signature authority for the plans. In early 2003, all existing and prospective air tour operators were required to apply in order to engage in this activity. Applications were received for more than 100 park units instead of the expected 55, requiring the preparation of plans for more than 100 parks over the next several years.

Commercial flight services operating in national parks can produce sound intrusions that diminish the park experience and affect natural resources. However, with careful planning and cooperation these intrusions can be minimized. For example, Badlands National Park boasts a good relationship with its air tour operator, who has agreed to avoid bighorn sheep habitat and to operate the helicopter in a way that minimizes rotor noise. The air tour plan for Badlands accommodates not only the operator's business interests but also the interests of park resource protection, maintaining a quality visitor experience, and safety.



Air tour planning was initiated at Mount Rushmore National Memorial (above) and Badlands National Park (left), South Dakota, and several other units of the National Park System in 2003.

Natural Sounds Program staff, working with FAA counterparts, is developing appropriate planning procedures by which to conduct these efforts. Air tour planning projects were initiated at 15 park units during 2003: Grand Teton, Glacier, Yellowstone, Petrified Forest, Badlands, Hawaii Volcanoes, and Haleakala National Parks; Kalaupapa, Kaloko-Honokohau, and Pu'uhonuau o Honaunau National Historical Parks; Puukoloa Heiau National Historic Site; Lake Mead National Recreation Area; Navajo and Canyon de Chelly National Monuments; and Mount Rushmore National Memorial. ■

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NPS**FACT**

The National Park Service formulates annual budget requests based, in part, on anticipated work levels needed to address a wide variety of potential resource impairment issues in parks. For example, **for FY 2004 it estimates that it will review 40 applications** for proposed new air emission sources within 200 miles of national parks, **inspect 25 new (of approximately 700 active)** mineral extraction operations in parks, and respond to chronic wasting disease in wildlife populations at two national parks. It also estimates that it will treat 83,000 acres (33,615 ha) of invasive exotic plants,* resolve water quantity issues in 10 park units, and assess airborne contaminants in nine parks.

**The National Park Service exceeded its FY 2003 performance goal of containing exotic vegetation on 122,600 acres (49,653 ha) by 144,880 acres (58,676 ha), bringing the total contained to 267,480 acres (108,329 ha). This gain of more than 100,000 acres (40,500 ha) reflects the deployment of seven additional Exotic Plant Management Teams and the continuing priority of parks to address harmful invasive species.*

Park resources protected from Washington Aqueduct discharges

By Jeff Bernstein, Doug Curtis, Sharon Kliwinski, and Gary Rosenlieb

THE U.S. ARMY CORPS OF ENGINEERS (the Corps) began construction of the Washington Aqueduct at the direction of Congress in 1853. Today the Corps owns and operates the Washington Aqueduct as wholesale water production facilities that provide all the potable water to about one million consumers in Washington, D.C., and parts of northern Virginia.

The aqueduct functioned for decades prior to the establishment of the Chesapeake and Ohio Canal National Historical Park in 1971, and now periodically flushes sediment through the park and into the Potomac River. The sediment discharges, their regulation, and their impact on park resources and the ecology of the river have raised public concern and controversy over the past couple of years.

"The aqueduct is one of a few water treatment facilities in the country that still discharges sediment back into a river instead of transporting it to a disposal facility."

The aqueduct system draws water from the Potomac River above Great Falls, Maryland, and carries it via an underground conduit to water treatment facilities in Maryland and the District of Columbia. During the treatment process, sediments from the river water bind with alum and settle in basins. Several times per year the basins are flushed to remove sediment buildup. Approximately 10,000 tons (9,070 tonnes) of alum-laden sediments are discharged annually to the Potomac River. Two conduits discharge sediments on parklands that flow to the Potomac River; a third discharges directly into the river. Chlorine used in cleaning the sediment basins and potentially toxic concentrations of naturally occurring metals such as iron may also be discharged. The aqueduct is one of a few water treatment facilities in the country that still discharges sediment back into a river instead of transporting it to a disposal facility.

Several agencies are involved in managing resources affected by the discharges. The National Park Service manages the park resources and, because of the unique relationship between the federal government and the District of Columbia, it also manages the Potomac River bed in the district as miscellaneous property for the Secretary of the Interior. The U.S. Fish and Wildlife Service manages resident and migratory fish species in the area of the discharges. The National Marine Fisheries Service is responsible for the shortnose sturgeon, an endangered species under the Endangered Species Act.

In 2001 the sediment discharges spawned numerous congressional inquiries and hearings and the filing of two lawsuits in federal court. The lawsuits claimed that responsible federal agencies did not properly account for the cumulative effects of the discharges on the environment and that the discharges violate the Corps's Clean Water Act permit issued by the U.S. Environmental Protection Agency (EPA).

In light of heightened public scrutiny, the Department of the Interior (the Department), with extensive technical and policy support of the National Park Service and Fish and Wildlife Service, evaluated its legal options and subsequently engaged in renewal of the Corps's discharge permit. Comments submitted during the permitting process focused on the adequacy of technical and scientific investigations underlying the draft permit and that the permit might not adequately protect park and Potomac River resources. The Department called for elimination of the sediment discharges, an option the Corps had resisted.

After two public comment periods, the final permit issued by the EPA included provisions that will result in significant reductions in discharged sediments and other pollutants to protect park and aquatic resources. Barring financial or other potential difficulties, it will take about seven years to build the physical facilities necessary to implement the permit. Because of this delay, the permit also requires that a number of studies requested by the National Park Service, the Fish and Wildlife Service, and the National Marine Fisheries Service be undertaken by the Corps to assess impacts of ongoing discharges on affected resources. This information could prove helpful in devising interim strategies for mitigating resource damage.

Although the Department of the Interior and the National Marine Fisheries Service were largely pleased with the final permit, the Corps was not. It filed an appeal with the EPA Environmental Appeals Board challenging the agency's authority to require environmental studies in the permit. Through facilitated negotiations, the agencies have reached a conceptual agreement that, if adopted after public notice and comment, will ensure that the necessary studies are conducted while meeting the needs of all agencies. Additionally, the agencies are working on a letter of understanding designed to ensure better interagency coordination on permit implementation issues.

The interpretation and use of good science and a detailed evaluation of legal options played important roles in shaping the Clean Water Act permit for the aqueduct. In light of the provisions of the final permit and the compliance agreement, the National Park Service and other federal parties are optimistic that operation of the Washington Aqueduct will eventually cease harming park resources and the aquatic resources of the Potomac River. ■

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Several times per year sediments and potentially toxic concentrations of iron and other naturally occurring metals are flushed from a water treatment facility and flow through this discharge structure in Chesapeake and Ohio Canal National Historical Park en route to the Potomac River. The discharge permit, held by the U.S. Army Corps of Engineers, was reviewed in 2003, resulting in significant future reductions in the amount of sediments and other pollutants that can be released from the facility to protect park and river resources.